A DATA BASE COMPUTER

INPUT

ABOUT INPUT

Formed in 1974, INPUT has rapidly grown to become a leading business consulting company in the information processing industry. It specializes in market research, planning services, and special analyses for users and vendors of computer, and communications, and office products and services.

The company carries out continuous and in-depth research with vendors and users in the industry. Our staff analyze and interpret the complex and voluminous data derived from this research, based on their experience and the needs of clients. This information is presented concisely and understandably through reports and presentations. Useful recommendations and access to back-up data are strong points of our client relations.

INPUT's professional staff have, on average, nearly 20 years experience in the information processing industry. Most have had senior management experience in operations, marketing, or planning roles. This expertise provides INPUT with unique strengths attested to by the company's client base, which includes many of the world's largest companies.

OFFICES

INPUT (Y-IN-DB)
AUTHOR
A Database Computer.
TITLE

UNITED STATES

2180 Sand Hill Road
Menlo Park, CA 94025
(415) 854-3422

15 Bond Street
Great Neck, NY 11021
(516) 482-4170

EUROPE

67A High Street
Sutton
Surrey SM1 1DT
England

JAPAN

Overseas Data Service Company, Ltd.
Shugetsu Building, No. 12-7 Kita Aoyama
3-Chome Minato-Ku
Tokyo, 107
Japan
(03) 400-7090

"A DATA BASE COMPUTER"

Prepared For:

INTEL CORPORATION
MEMORY SYSTEMS DIVISION

INPUT LIBRARY

DECEMBER 1977

INPUT LIBRARY

INPUT

"A DATA BASE COMPUTER"

TABLE OF CONTENTS

Page

I INTRODUCTION 1
  A. Purpose 1
  B. Research 1

II EXECUTIVE SUMMARY 2
  A. Conclusions 2
  B. Recommendations 5

III ACCEPTANCE AND USAGE OF DATA BASE SYSTEMS 7
  A. Overall Acceptance 7
  B. The Extent Of Usage 9
  C. Strengths Of Current Systems 15
  D. Weaknesses Of Current Systems 15
  E. Reliability Of Current Systems 16
  F. Desired Improvements Of Current Systems 16
  G. Conclusions Reached On DBS Acceptance 17

IV USER UNDERSTANDING OF DATA STRUCTURES 18
  A. Knowledge Of Data Structures 18
  B. User Evaluations Of Data Structures 18
  C. Conclusions Concerning Technical Knowledge 22

V REACTIONS TO THE INTEL PRODUCT 23
  A. User Ratings Of Potential Benefits 23
  B. Would The Benefits Prompt Conversion? 26
  C. The Need For Conversion Assistance 28
  D. The Importance Of Cost Savings 28
  E. The Implementation Of New Applications 31

VI SUPPORT REQUIRED 32
  A. Current Systems 32
  B. Languages 32

Page

VII STRENGTHS AND WEAKNESSES IN THE MARKETPLACE 33
A. Respondents' View 33
B. INPUT's Analysis 36

VIII DBC FORECAST 1978-1983 39
A. Forecast Assumptions 39
B. Market Forecast Methodology 40
C. DBC Market Forecast 41
D. Forecast Qualifications 41

APPENDIX I: INTERVIEWS CONDUCTED 45

APPENDIX II: OTHER INTERESTED PARTIES 49

APPENDIX III: RESPONDENTS CONCERNED WITH TECHNICAL DETAILS OF THE PROSPECTUS 52

APPENIDX IV: QUESTIONNAIRE 53

"A DATA BASE COMPUTER"

LIST OF EXHIBITS

			Page
II	-1	Respondents' Perception As To The Attractiveness Of The DBC's Performance Characteristics	4
III	-1	Percentage Of Organizations, By Industry, Having Data Base Systems Installed - By Sector	8
	-2	Primary Data Base System Installed	10
	-3	Respondents' Replies As To The DBMS Currently Being Used	11
	-4	Methods In Which Respondents Are Operating Their DBMS	14
IV	-1	Respondents' Apparent Knowledge Of Various Data Models	19
V	-1	Importance Of Following Benefits As Perceived By Interviewees (1977)	24
	-2	In Converting A DBMS, Interviewees' Ranking As To The Most Important Expected Savings	29
VIII	-1	Potential Market Growth For The Non-IBM "DBC" Product Line Concept	42
	-2	Intel "DBC" Shipments And Saturation Of Potential Market	43

Digitized by the Internet Archive
in 2015

https://archive.org/details/databasecomputerunse

I INTRODUCTION

I INTRODUCTION

A. PURPOSE

The purpose of this study was to analyze and forecast the U.S. market (1977-1982) for large data base applications; to determine the potential degree of market penetration for Intel's Data Base Computer; and to provide information as to the advisability of Intel investing additional resources in the development of this program.

B. RESEARCH

The research for this program was divided as follows:

- Thirty large data base user interviews concerning: attitudes, issues, products employed, conversion experiences, and evaluation of Intel as a potential vendor.
- Research analysis of available data involving data base markets and products.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. CONCLUSIONS

- Data base systems are a key segment of the EDP environment and will continue to increase in importance over the next five years.
    - About two-thirds of large users have DB systems installed.
    - INPUT forecasts that the market for DBMS software packages will expand from $70 million in 1977 to $250 million in 1982.
    - INPUT forecasts that the DBMS services market will increase from about $300 million in 1977 to over $1,000 million in 1982.
- Respondents are definitely oriented towards hierarchical structured data bases, and are far less familiar with the network or relational structures.
- Users are reluctant to change data base systems due to difficulties encountered during conversions and implementations.
- Conversion has been expensive for users. Very few know the exact cost or want to know.
- IMS is the leader by far in large installations.

  - The key strength of IMS, as viewed by the user, is IBM support! Some IMS weaknesses reported include learning difficulty, being complicated and reliability.

- Some of the applications best suited for DBMS:

  - On-line systems.

  - Planning and MIS.

  - Requirement for ad hoc reporting.

- Sample applications least requiring DBMS:

  - Routine accounting.

  - Heavy computation.

- Respondents reacted favorably to the Data Base Computer's (DBC) performance characteristics with 59% rating it 1 on a scale of 1 to 5. (Exhibit II-1.)

  - Product strengths of the DBC include flexibility, performance, large user orientation and potential savings.

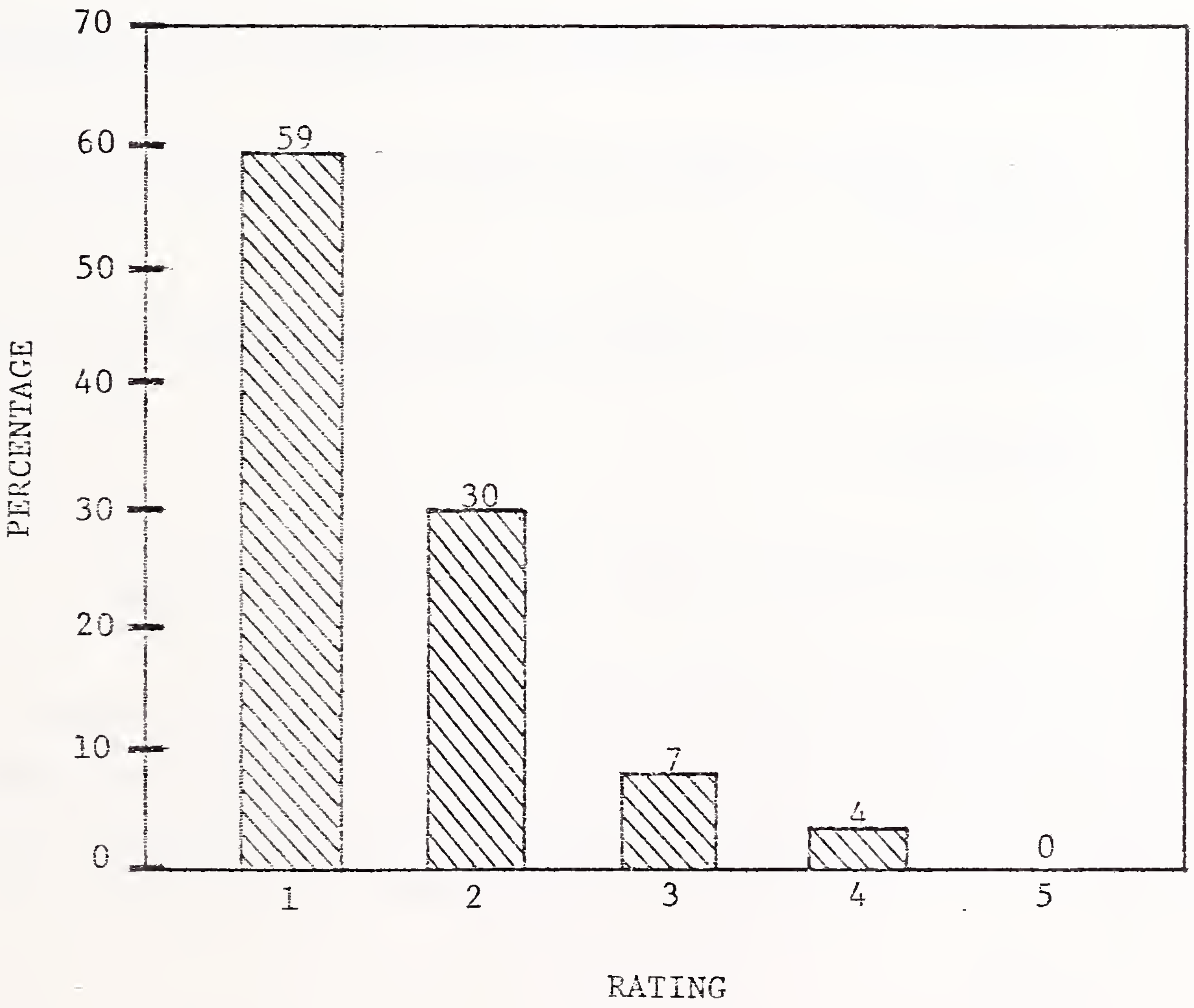
  - Weaknesses recorded include Intel's lack of market presence, new product skepticism, and reluctance for users to convert from their present systems.

- The market potential for the DBC product line is expected to expand from about $60 million in 1978 to $150-200 million by 1982.

  - The Intel product has the potential opportunity of capturing 30% market share by 1982.

EXHIBIT II-1

RESPONDENTS' PERCEPTION AS TO THE ATTRACTIVENESS OF THE DBC'S PERFORMANCE CHARACTERISTICS (1 = HIGHEST)



B. RECOMMENDATIONS

- Recognize that marketing a DBC product line requires a total corporate commitment to the "systems" business.
  - Capital requirements are substantial.
  - Software and maintenance capabilities must be established.
  - A "lease deck" marketing tool should be considered when calculating cash flow.
  - Customer training will become a key element in the marketing plan.
  - The company image must expand to include the "large end user" orientation.
- In evaluating market opportunities, emphasize specialization as related to:
  - Geography.
  - Application/industry (E.G., computer services, banking).
- Consider establishing a "joint venture" with a substantial company who would serve as a capable partner for Intel. Such a candidate should possess a good image with the large company data base user as well as being strong in systems software, and in understanding EDP hardware. Some examples are::
  - CDC
  - Itel
  - DEC
  - ADP
  - Memorex

- Consider selling the product first to remote computing services vendors such as Tymshare, NCSS, BCS, MCAUTO, et al. These organizations have the sophistication and internal facilities to utilize the product without needing the same level of support as the average user. Working closely with such firms during the development phase would undoubtedly assist Intel in avoiding many pitfalls when introducing and testing the new product to the general market.

III ACCEPTANCE AND USAGE OF DATA BASE SYSTEMS

III ACCEPTANCE AND USAGE OF DATA BASE SYSTEMS

A. OVERALL ACCEPTANCE

- The promotion of data base concepts has been successful in the data processing community. INPUT's analysis of EDP Plans and Budgets for 1977 indicated 67% of all major computer installations have one or more data base systems installed.

- The increased use of data base management systems in the remote computing services marketplace was described in another INPUT report entitled, Data Base Management Systems. The extension of data base services to "non-EDP" users through proprietary data base management systems incorporating relational data structure was identified as one of the most rapidly growing segments of the computer services market.

- The interest in data base systems is not industry dependent. Exhibit III-1 depicts the percentage of enterprises having data base systems installed by major sectors of the EDP marketplace:

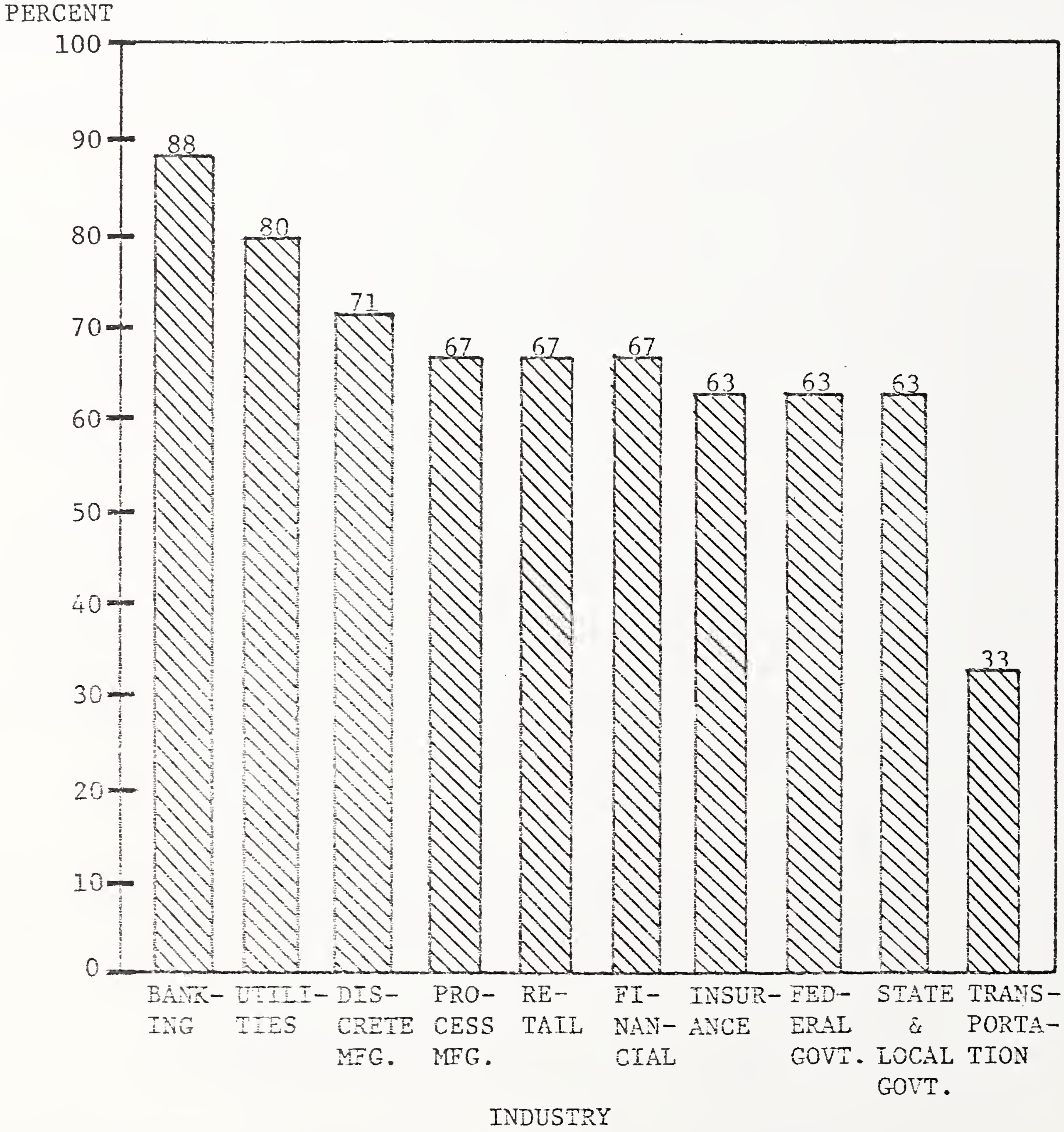
  - Penetration clusters around 60-70% for 7 of the 10 sectors.

  - Bankers and public utilities demonstrate the greatest penetration with 88% and 80% respectively.

  - Transportation has the least penetration with only 33%.

EXHIBIT III-1

PERCENTAGE OF ORGANIZATIONS, BY INDUSTRY, HAVING DATA BASE SYSTEMS INSTALLED - BY SECTOR*



*SOURCE: EDP PLANS AND BUDGETS 1977 INPUT

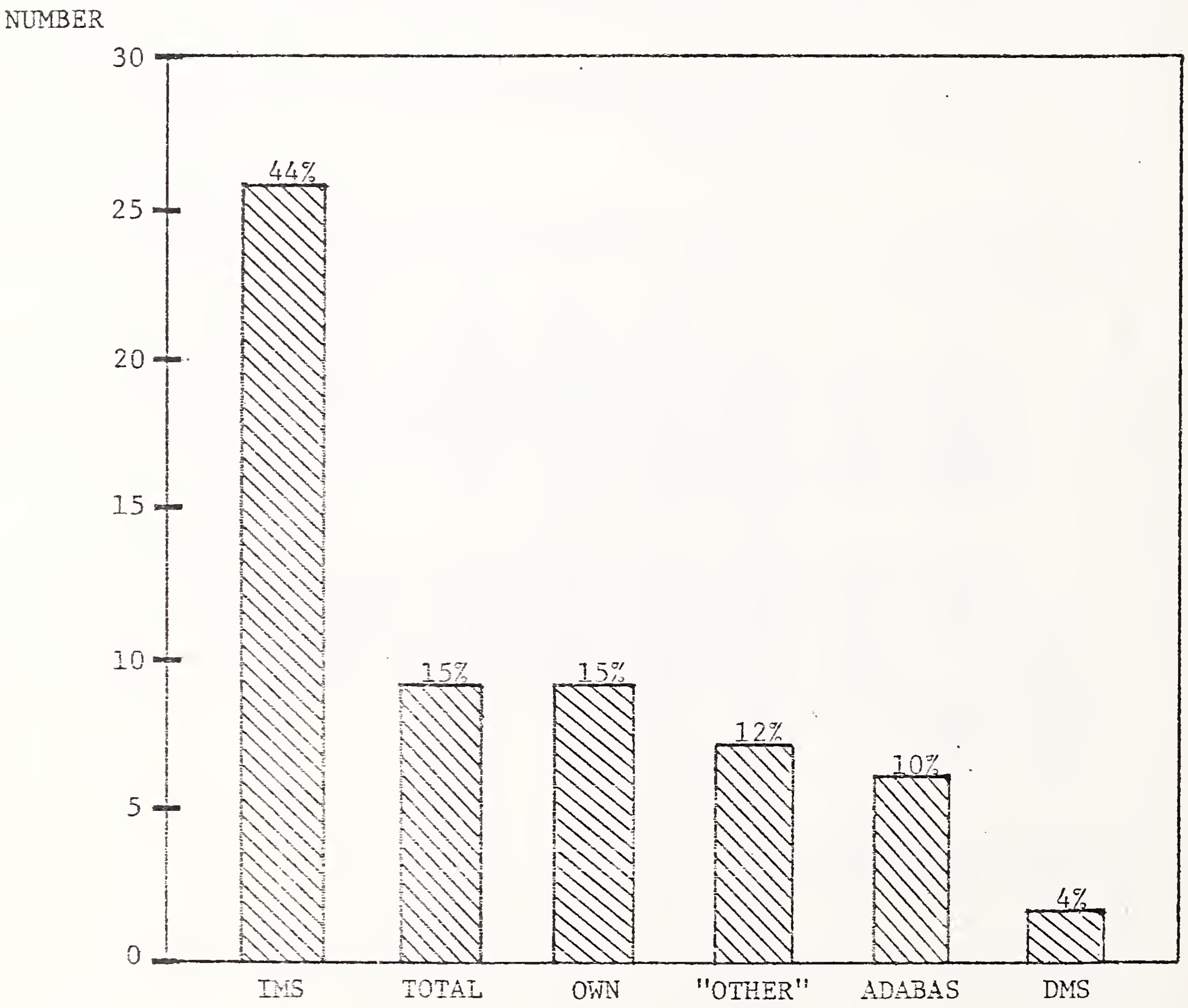
- The installation of specific systems is presented in Exhibit III-2.
    - In the EDP Plans and Budget study, IMS was the most widely used system being installed by 26 organizations and representing 44% of the total number. Confirmation of this ratio is supplied by the respondents' replies (see Exhibit III-3).
    - Many organizations had more than one system installed.
    - Data base services revenues from computer services companies are not included in these figures.
- The acceptance of data base concepts does not necessarily indicate satisfaction with installed systems.
    - The public utility, life insurance, retail, and discrete manufacturing segments all mentioned data base implementation as being their most significant EDP problem.
    - Dissatisfaction was also indicated by a large number of users (approximately 25%) who are thinking about changing systems or still looking for solutions to certain problems even though they have systems installed.

B. THE EXTENT OF USAGE

- Having a data base system installed does not necessarily mean it is being used for a significant portion of the user's application set. Research for the Data Base Computer study revealed:
    - Fifty-eight percent of the respondents felt that more than 75% of their applications were well suited to the use of DBMS.

EXHIBIT III-2

PRIMARY DATA BASE SYSTEM INSTALLED*

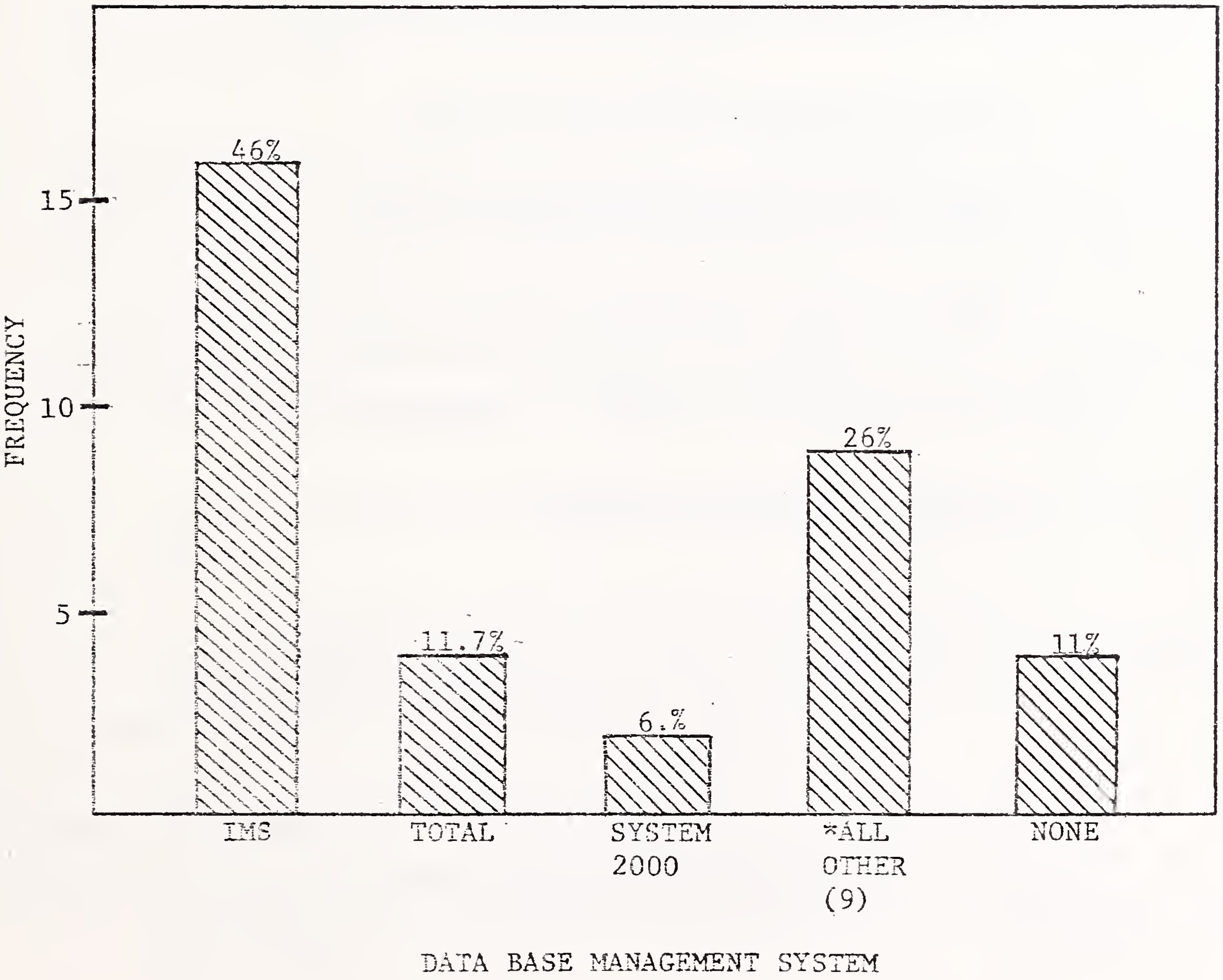


*SOURCE: EDP PLANS AND BUDGETS 1977 INPUT

EXHIBIT III-3

RESPONDENTS' REPLIES AS TO THE

DBMS CURRENTLY BEING USED



*ONE RESPONDENT PER DBMS

  - However, only 25% had more than 75% of their applications actually implemented using DBMS, and 55% had less than 30% implemented.

- The types of applications deemed best suited for implementation were:
  - Applications which need to share data.
  - On-line systems.
  - Planning or management information systems.
  - Systems requiring extensive data analysis.
  - Systems with ad hoc reporting requirements.
  - Systems requiring extensive maintenance (subject to change).

- Applications least suited for DBMS were considered to be:
  - Routine accounting applications.
  - Stand alone systems (batch or those not sharing data).
  - Systems where sequential tape processing is more economical.

- Most users were in agreement that conversion to DBMS was both costly and time consuming. While few could give estimates of cost, some remarks are as follows:
  - "It wasn't cheap! Conversion has taken several years. Don't know if anyone has added up the costs or really wants to know."
  - "Cost was way over $1 million. We're too embarrassed about it to give the actual figure."

- "It was expensive, but worth it."

- "$1 million."

- It is probable that the conversion to "data base" also involved conversion of operating systems for many IBM customers (OS or DOS to VS) and cannot be attributed solely to implementing DBMS. However, it was a traumatic experience for those involved.

- As shown in Exhibit III-4, over 50% of those replying during the interview operated their DBMS in a mixed environment.

- Respondents were practically unanimous in their agreement that their use of DBMS would increase over the next five years, but few could estimate how much. This implies lack of a firm plan even though many are "committed."

- Some typical comments concerning the anticipated increase in DBMS usage over the next few years were:

  - "Major emphasis is on developing manufacturing applications and to use IMS."

  - "Will probably be substantial. Two on-line systems have been proposed, both would be large data bases."

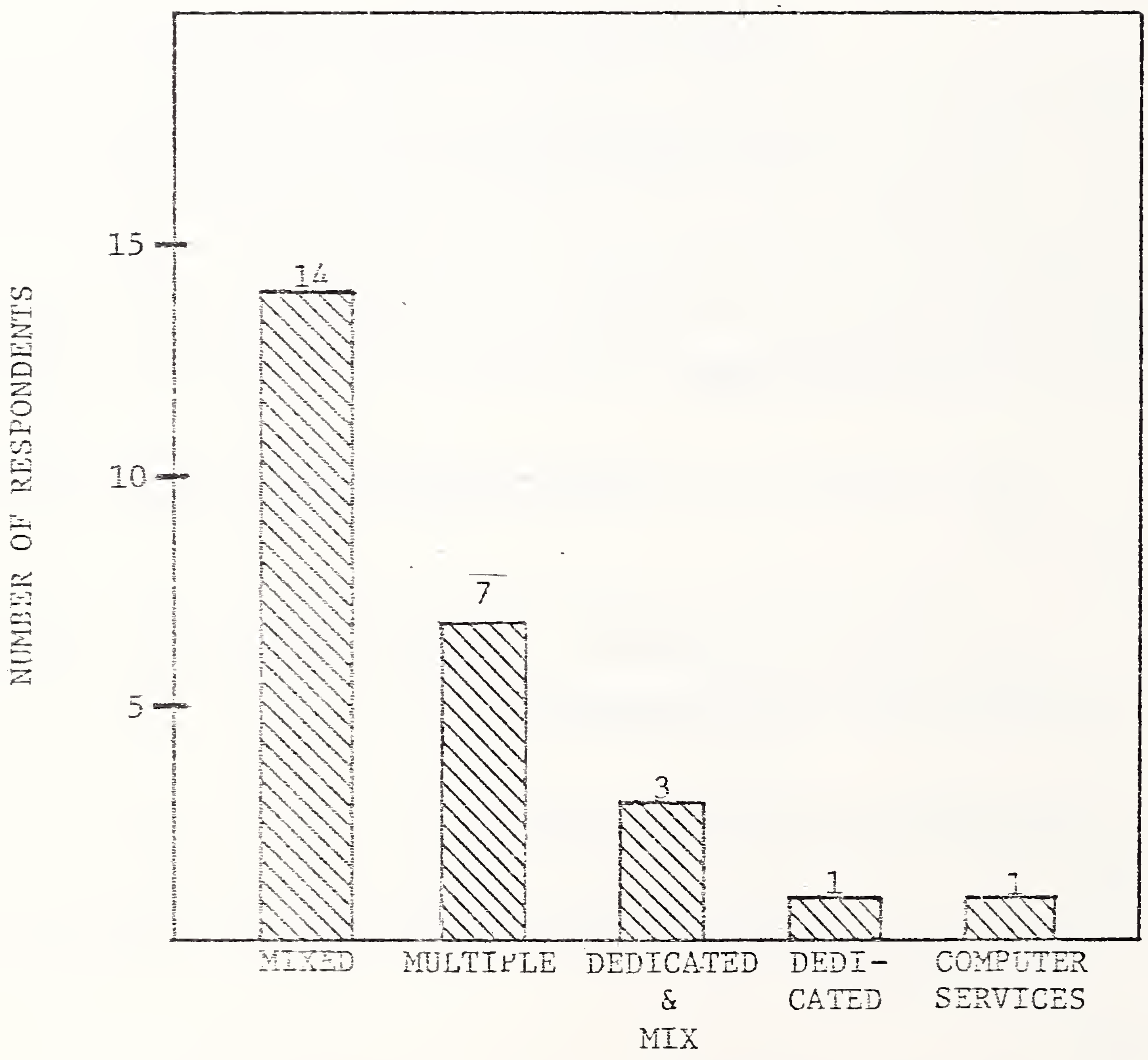
  - "Anticipate enormous increases."

  - "We are planning on converting all our applications to DBMS within the next 3 years."

  - "Fifty percent increase in usage over the next 3 years. Could be a higher increase if we could improve productivity of system development people. What we really need is a faster way to implement applications."

EXHIBIT III-4

METHODS IN WHICH RESPONDENTS ARE OPERATING THEIR DBMS



TYPE OF SYSTEM

C. STRENGTHS OF CURRENT SYSTEMS

- When asked for strong points of their current systems, IMS users most frequently mentioned IBM support. As one user put it: "Have you ever heard of Marshalltown, Iowa? No one but IBM could support us in this remote location."

- Users of TOTAL and IDMS all mentioned "ease of use" as being the strong point of their systems.

- A user of ADABAS mentioned it was closer to a relational data model than others; and since he felt "relational is the way everything is going," it was selected.

D. WEAKNESSES OF CURRENT SYSTEMS

- The list of weaknesses for IMS is as follows:

  - Difficult to learn.

  - Complicated.

  - Performance, resource usage, overhead.

  - Restricted to hierarchical files.

  - Security.

  - Reliability.

- The above were not single statements of weaknesses, but were mentioned by multiple IMS respondents in various combinations.

- A user of TIMS-8 (Univac) mentioned enormous computer resource consumption and poor Univac maintenance.

- Users of TOTAL mentioned data integrity, security, performance and the fact it has not kept pace with the state-of-the-art.

- A user of IDMS mentioned poor response time, and the ADABAS user stated it wasn't very good for "sequential processing."

E. RELIABILITY OF CURRENT SYSTEMS

- IMS reliability was rated as much improved and that appears to be one thing which is no longer a problem.

- Users of other systems also indicated reliability was quite good.

F. DESIRED IMPROVEMENTS FOR CURRENT SYSTEMS

- IMS users had suggestions for improvement which addressed the formidable list of weaknesses they identified earlier. Requested improvements were:

  - Decent query language.

  - Good data dictionary.

  - Closer integration with operating system.

  - Improved performance.

  - Graphics interface.

  - More flexibility (select features, add terminal without sysgen).

- TOTAL users requested inverted file structure, distributed processing capability, tape logging, and improved error handling.

- The IDMS user requested an improved query language.

G. CONCLUSIONS REACHED ON DBS ACCEPTANCE

- Data base systems are currently an important part of the data processing environment and will become even more important over the next five years.

- Current user installed systems are not satisfying many users' requirements and they are actively seeking solutions.

- These relatively simple conclusions about the acceptance of the DBC were supported during INPUT's research in a very direct manner. People were willing (and even enthusiastic) to review a fairly complex technical document and submit to a lengthy and detailed interview. This is not normally the case in the data processing industry.

IV USER UNDERSTANDING OF DATA STRUCTURES

IV USER UNDERSTANDING OF DATA STRUCTURES

A. KNOWLEDGE OF DATA STRUCTURES

- As shown in Exhibit IV-1, most users were familiar with hierarchical data structures (25 of 30 respondents). Since most interviewees had DBS installed (or had evaluated them), this was to be expected.

- Only half of those interviewed (15) had any knowledge of network structures even though most were specifically associated with data base administration. (Perhaps de facto standards are more important than industry efforts.)

- Only half had any knowledge of relational structures (or thought they had).

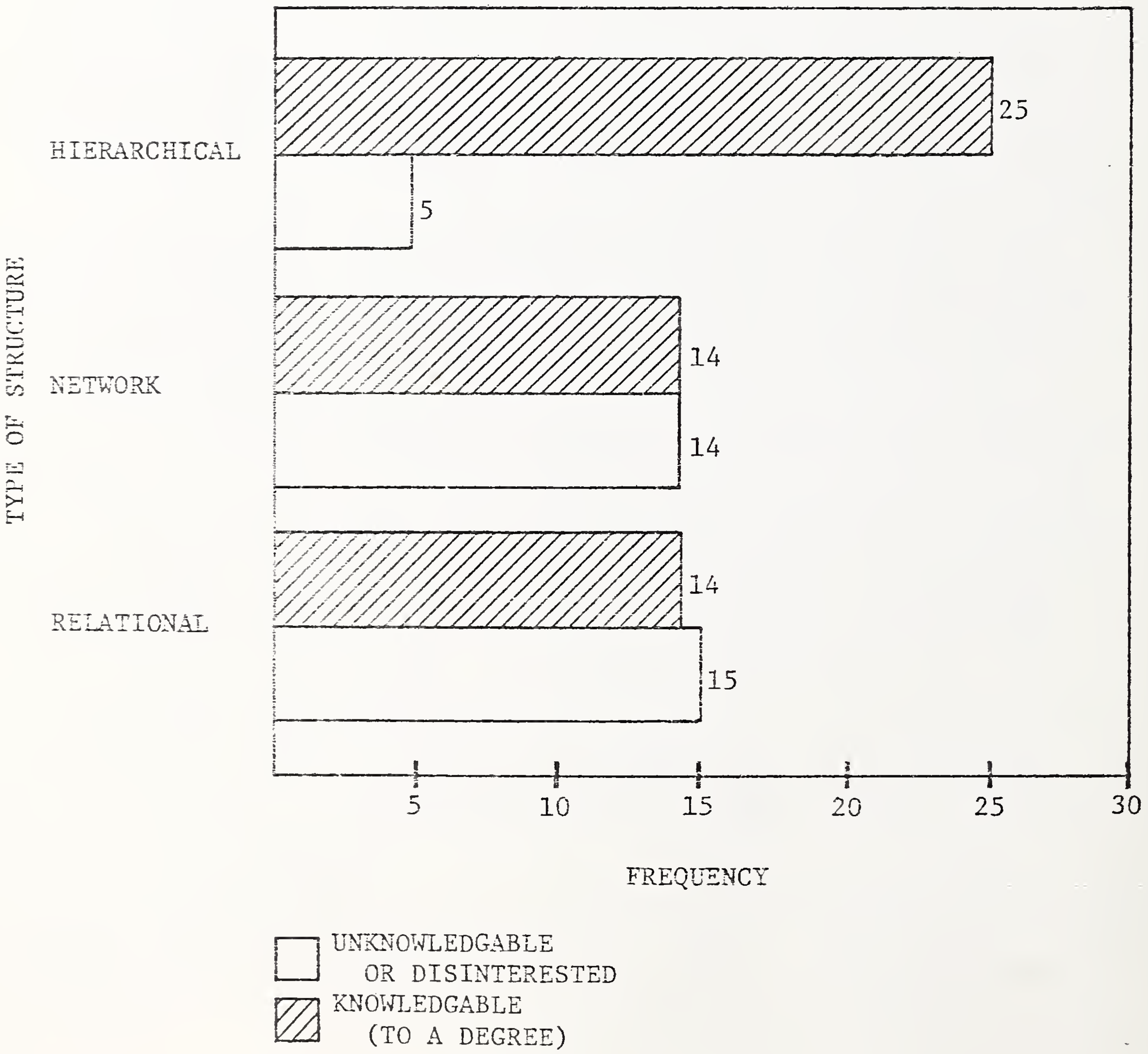
- The question concerning the percentage of applications which could be satisfied was answered by only 5 respondents, and no confidence should be placed in the results.

B. USER EVALUATIONS OF DATA STRUCTURES

- Among the users having knowledge of data structures there was little consensus on their relative merits. However, this is not difficult to understand since even the "experts" cannot seem to agree.

EXHIBIT IV-1

RESPONDENTS' APPARENT KNOWLEDGE OF VARIOUS DATA MODELS



- Generally, the reaction to hierarchical structures can be characterized as follows:
  - Users are familiar with it and can understand it.
  - It is rigid, the number of levels is limited and maintenance is a problem.
  - While most applications can be implemented, care must be exercised during implementation.
- Network structures were usually viewed as being superior to hierarchical, with greater design flexibility, and especially appropriate for "real world problems" such as manufacturing systems.
- Specific comments concerning relational structure are as follows:
  - "As we understand it, if you have a relational data base you also have network and hierarchical capabilities. So if you are going to build one, build it relational."
  - "Relational data structures would probably be the best one to implement on the DBC because hardware design will be easier. However, relational structures have not been practical for many applications. It appears on the surface that they are simple, but in fact they are not. It's easy to perform functions such as updating with relational structures. The different levels of relational structure are more and more complex. I am not aware of any data base being offered that is truly relational. All of the bugs haven't been worked out."
  - "Relational structures will allow faster response time - this is where users really get the payback."
  - "I like the relational approach - think it would work best for us. A logical procedural method for determining a logical design."

- "Good for applications where you have to look at a lot of bits and pieces. Marketing and educational systems are examples."

- "Would be a much better approach from the end user's viewpoint. Would satisfy the type of inquiries they like to make. However, complexity of the relationship may affect maintenance and recovery. Recovery has to be done concurrently."

- "Relational is better for retrieval, especially for ad hoc retrievals. (I wish we could get the technical jargon out of the literature. It is too mathematically oriented and difficult for the business community to understand.")

- "More flexibility, easier to use for ad hoc inquiries. Implementation is easier because of the canonical data base structure - end result is third normal form. If you have this, what more do you have to do to implement it?"

- "Codd and company don't understand the problem - forget relational."

- "Already using RAMIS and NOMAD for management planning - perhaps relational would permit some operational inquiries not satisfied by current systems (IMS)."

- "Sounds good, the medical people really need this type of organization."

- "High percentage of end users can phrase questions which are set oriented - queries lend themselves to relational structures."

- "Great for planning and queries."

- "Real advantage is ease of change and flexibility."

- "Personally feel relational is best. However, I feel you also have to provide a view so people can also look at it as network or hierarchical."

- "Generation gap. Whole generation of people who are used to looking at records in a sequential processing mode. TOTAL had to retrofit sequential processing. People would not use a relational model directly. There has to be a transition that gets data into a relational structure."

- When asked to evaluate the relative merits of the three data models, most people felt all three should be available, and most said they didn't really care how data was structured. To quote one respondent: "I don't even like to read about structures - I find it very boring."

C. CONCLUSIONS CONCERNING TECHNICAL KNOWLEDGE

- Most interviewees are oriented towards hierarchical structures - which are being sold in the marketplace. (Past studies have indicated users are reluctant to change - hardware, software or concepts.)

- Even those knowledgeable about data structures concede that substantial education will be required - for both rank and file systems personnel and end users.

- The education problem should not be underestimated - both in marketing and in support.

V REACTIONS TO THE INTEL PRODUCT

V REACTIONS TO THE INTEL PRODUCT

A. USER RATINGS OF POTENTIAL BENEFITS

- Exhibit V-1 displays the relative importance of various potential benefits or features as reported by the users interviewed.

- The following "back-end" benefits received a high number of positive responses (1 & 2):

  - Off-load host.

  - Improved cost performance.

  - Data security.

  - Provides consistency.

  - Distinct DB hardware.

- Some back-end benefits actually received low ratings (4 & 5):

  - Facilities mainframe change.

  - Network data exchange.

EXHIBIT V-1

IMPORTANCE OF FOLLOWING BENEFITS, AS PERCEIVED BY INTERVIEWEES (1977)

		HIGH	MEDIUM	LOW
a)	BACKS-END			
	OFF-LOAD HOST	18	1	3
	DATA BASE SHARING	9	4	8
	NETWORK DATA EXCHANGE	6	5	10
	CHANGE MAINFRAMES	5	0	16
	DISTINCT DATA BASE HARDWARE	11	8	2
	IMPROVED COST PERFORMANCE	17	4	4
	ENHANCED DATA SECURITY	14	8	1
	PROVIDES CONSISTANCY (OS & COMPILERS)	12	7	2
	DISTRIBUTED PROCESSING (AVAILABILITY)	9	8	6
b)	SET-ORIENTED PROCESSING			
	REDUCE APPLICATIONS PROGRAMMING	21	3	0
	REDUCES DATA TRANSFER	11	7	2
	OPTIMIZE DATA MANIPULATION	18	3	0
c)	ASSOCIATIVE PROCESSOR			
	EFFICIENT EXECUTION	17	5	0
	BALANCES RESPONSE TIMES	13	7	0
	ELIMINATES INDEXING	12	6	2
	REDUCES STORAGE REQUIREMENT	8	6	6
	GREATER CONCURRENCY	10	5	4
	REDUCES DB ADMINISTRATION COMPLEXITY	16	4	0
	IMPROVES COMMAND TRANSLATION	12	5	4
	MODULARITY OF ARCHITECTURE (LOW COST INCREMENTS)	14	5	1
	IMPROVED RELIABILITY	16	4	1
	IMPROVED SECURITY & INTEGRITY	13	5	3
	REDUCES DATA TRANSFER	13	6	1

- The benefits of set-oriented processing all received high positive ratings:

  - Reduced application programming.
  - Optimized data manipulation.
  - Reduced data transfer.

- The associative processor did not receive any substantial negative responses. In fact, several interviewees (4) rated them all as high and stated "it would be difficult to argue against these benefits - they're all important." High positive responses were:

  - Efficient execution.
  - Reduced DBA complexity.
  - Improved reliability.
  - Modular architecture.
  - Balanced response time.
  - Improved security and integrity.
  - Reduced data transfer.
  - Improved command translation.
  - Eliminates indexing.
  - Greater concurrency.

- The ratings indicate significant concern about price/performance of current data base systems and the complexity of both programming and data base administration.

- Few respondents felt the relative importance of the benefits would change in the future. Those who did indicate change believed the relative importance would increase. The most frequently mentioned increases in importance were all under "back-end" and are as follows:

-	Distributed processing	8
-	Data security	6
-	Improved cost performance	6
-	Network data exchange	6

- Security and integrity are of concern, but computer networking and distributed processing are viewed as tomorrow's problems.

- Some people expressed concern about specific benefits being achievable and qualified their ratings with statements such as: "If they can do it."

B. WOULD THE BENEFITS PROMPT CONVERSION?

- This key question was answered by only 6 of 25 respondents as an unequivocal "yes." Eight stated "no" and eleven said "Possibly."

- The primary reason for the "no" response was commitment to current systems (especially IMS).

    - The commitment to current systems is based on estimated investments which are substantial. For example, one respondent states: "IMS training has cost us $40,000 per person."

- There is also the implication that it would be difficult to go back to management with a new solution to an old problem which supposedly has been solved.

- The other factor is an extreme reluctance to switch to unproven technology.

- The "yes" answers were frequently qualified as follows:

  - "If conversion tools are available."

  - "If it really can do all of the above."

  - "Yes, when we get serious about data base."

  - "If we can get a ten fold increase in price/performance we would have to say yes."

  - "Yes, there would be a strong impetus to consider it if the DBC can really perform as stated."

- The "possibly" category expressed certain concerns about the product for the following reasons:

  - Doubt that it could really provide the benefits claimed - "I doubt whether Intel will produce something that knocked your socks off."

  - The need for more information than was contained in the prospectus.

  - The reluctance to consider new technology (and another vendor).

  - Conversion costs would have to be determined.

C. THE NEED FOR CONVERSION ASSISTANCE

- Only two people said they would not need software conversion tools, and those who said "yes" (21) felt strongly about the requirement using such terms as: "definitely," "absolutely," and "damn right we'll need them."

- Twenty-three respondents expressed the need for systems engineering support and no one answered in the negative. This support was primarily associated with training of customer personnel, but some also indicated the need for some hand holding.

- Six users stated such support should be separately priced, eight said it should be included in the hardware cost, and nine said it would depend on hardware cost or they would split the cost with Intel.

D. THE IMPORTANCE OF COST SAVINGS

- Respondents were asked to rank (in order of importance): hardware savings, storage savings, personnel savings, and responsiveness:

    - As shown in Exhibit V-2, responsiveness and personnel savings were deemed most important with responsiveness having a slight edge, and obviously there is a close association between the two.

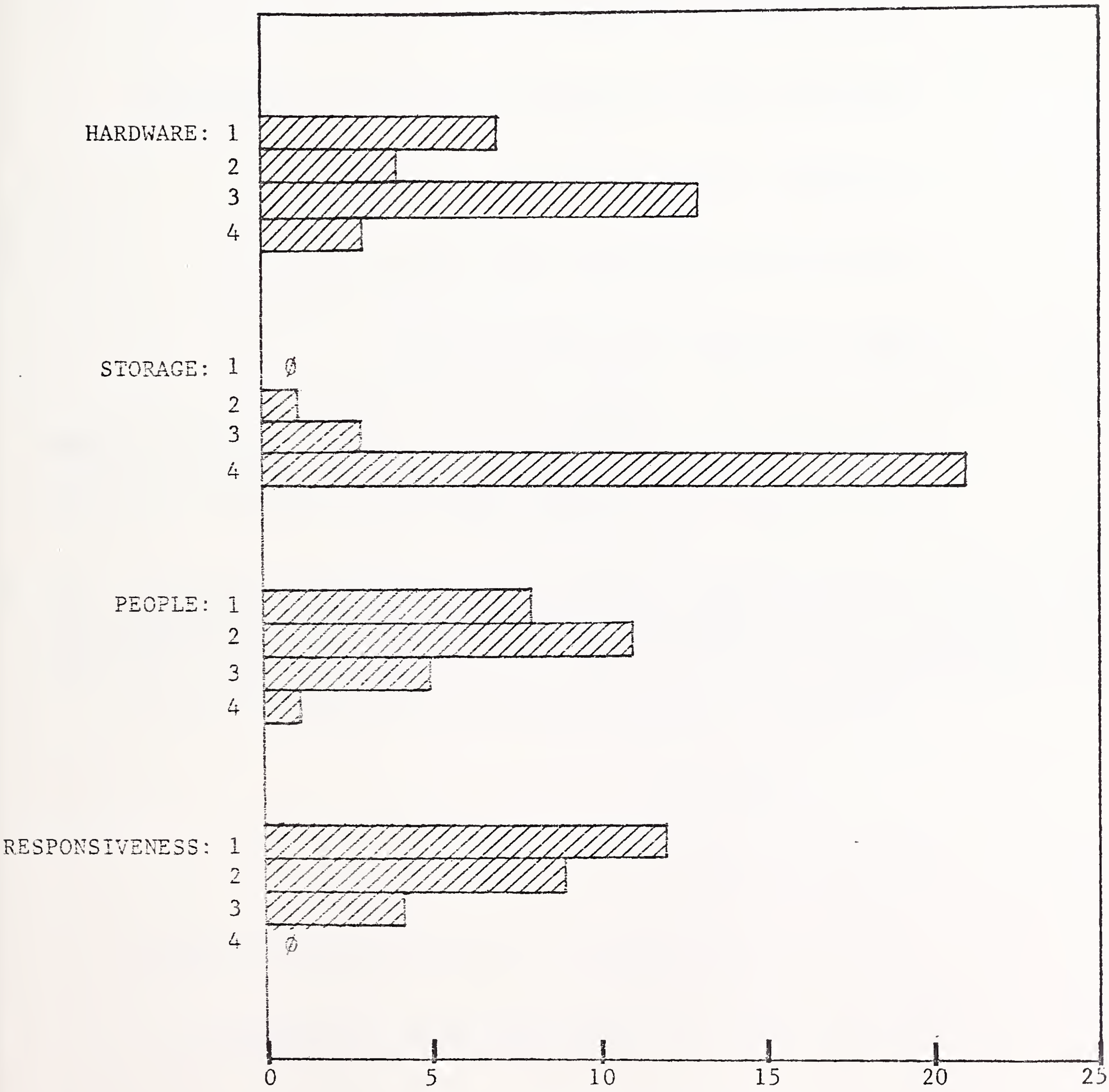
    - Hardware price/performance was a relatively strong third in importance. Storage savings was considered unimportant.

- Cost savings justification was not an issue lending itself to a crisp analysis. This resulted from various means of cost calculations; considerations of "payback" versus "return on investment," and a reported lack of concern in some cases. Some typical comments were:

EXHIBIT V-2

IN CONVERTING A DBMS, INTERVIEWEES' RANKING AS TO THE MOST IMPORTANT EXPECTED SAVINGS:

(1 = MOST IMPORTANT)



FREQUENCY OF RANKING

- "Cost is not critical - we are more concerned about reducing cost of programming staff."

- "Cost is not critical - would need more proof of its capabilities. Would have to prove conversion costs would be nominal."

- "Savings would be based more in terms of avoiding costs in the future: increasing efficiency and not having to buy a larger mainframe."

- "Would have to prove it would save money over a 3 year period."

- "Would have to return investment within 2 years."

- "Operationally, it would have to be a wash or better."

- "Payback would have to be within 2 years."

- "Savings over cost would have to be a 5 to 1 ratio. (If this was IBM's product rather than Intel's we'd probably accept less.) Ease of use is the most important consideration."

- Practically everyone felt the performance characteristics were attractive (24 of 27 rated it "1" or "2" on a scale of five). However, many saw fit to qualify their answers:

- "Yes, for a paper tiger."

- "If they can really build it."

- "Attractive on paper, would have to prove that it really worked."

- "Questions whether Intel can really achieve what they claim."

E. IMPLEMENTATION OF NEW APPLICATIONS

- The DBC was found to have characteristics which would permit the development of new applications and would be more end user oriented. (By 12 of 20 interviewees.) The applications were oriented around improved responsiveness to terminal queries, ad hoc reports, and data base maintenance.

- Those who felt the DBC would not permit them to develop new applications felt that way for the following reasons:

  - "Can currently do everything with IMS."

  - "Need more information on the product."

  - "Even if available now, the agency couldn't buy and begin to use it before 1983."

  - "IMS will satisfy requirements."

- The primary reason for the "no" responses was that the respondents seemed unable to visualize a "new application," and viewed the DBC as another "tool" to do what they were currently doing. (It should be noted that Data Base Administrators do not necessarily have applications expertise.)

VI SUPPORT REQUIRED

VI SUPPORT REQUIRED

A. CURRENT SYSTEMS

- While the questions on support for existing systems did not disclose as much meaningful information as we had hoped, the respondents seemed to feel:
    - They should have the same capabilities they now have.
    - These capabilities should be extended to include relational data bases.
    - They were ambivalent about whether support would be required for current query or data manipulation languages.

B. LANGUAGES

- Sixteen out of twenty-three respondents did not feel a procedural language would be required as long as language interfaces to the host were available.
- However, those who viewed the data base computer as other than a "back-up" expressed a need for at least a simple procedural language.
- Language interfaces were deemed necessary for all languages of any importance to the individual respondent.

VII STRENGTHS AND WEAKNESSES IN THE MARKETPLACE

VII STRENGTHS AND WEAKNESSES IN THE MARKETPLACE

A. RESPONDENTS' VIEW

- About half of the users reported an "interesting" reaction to the DBC, versus one-third being "enthusiastic." The balance stated some degree of skepticism and questioned Intel's capability of actually being able to provide the product.
  - One respondent found the concept excellent and wondered why IBM hasn't already developed a similar product.
- The respondents felt the strength of the product in the marketplace would fall into the following categories:
  - Improved price/performance would be attractive.
  - Medium and large companies with reasonably large data bases.
  - A separate data base computer would be attractive.
  - Ease of use for programmers, data base administrators, and end users.
  - The flexibility provided by the system.
- Most respondents were able to identify several positive factors for the DBC as a technical product. However, many qualified their answers with "if it works."

  - "Would sell to medium and large companies who have a centralized host computer and a decentralized organization."

  - "Its acceptance and usage will be dependent on conversion tools."

  - "Performance improvements, would reduce complexity of DBMS."

  - "Companies who would buy it: Organizations like Sears or an airline who had many locations and a requirement to share the same data base. Also, a company could buy one and sell it as a service like the timesharing business."

  - "A piece of software/hardware to do one function will be much more efficient. Hopefully it would require less people to support it."

  - "Would allow companies to stay on a DBC for a longer period of time; don't have to upgrade."

  - "Better performance, reduction in development time. People savings would be the most important for us."

  - "Excellent for large data bases, high volume, on-line networks, distributed processing."

  - "Price/performance. Would permit small user to have data base capability."

  - "In-house off-loading most important. Networking should be highly desirable."

- The responses to the question concerning factors which might inhibit the acceptance of the DBC in the marketplace can be categorized as follows:

  - Intel is a "new company" in the computer systems business and would have to sell itself as well as the product.

- Marketing a new technology, product, and concept all in the same package would be difficult.

- The reluctance (or even inability) of large customers to convert installed data base systems.

- The problem of convincing customers that they would receive adequate support.

- The cost of conversion!

- The lack of credibility as to whether the product will actually work as described.

- The head-on confrontation with IBM.

- Many respondents had multiple reasons why there would be resistance. Among the comments were:

  - "New product - does not have a user base. Companies who are heavily involved in a DBMS probably couldn't afford to change."

  - "Reason for using a DBMS on a large machine is to gain flexibility. Incorporating software into the hardware will lessen flexibility."

  - "Fear of the unknown - too risky to take a chance on a new product. Users can also go out and buy minicomputers which can handle some of their DBMS problems. Basic competition could be minicomputers."

  - "Companies who have heavy investments in a DBMS. Intel would have to prove there were drastic improvements in the DBC software to get old DBMS users to convert."

  - "Conversion is difficult and costly. Must be able to prove it will be reliable. Cost of hardware must be competitive."

- "One more piece of hardware to worry about. Why do we have to have the extra hardware?"

- "Marketing expenses will be a tremendous drain - can Intel afford it? Failing point of the DBC could be the the software."

- "Not convinced they can build a machine and deliver performance without any indexes."

- "Intel should think very hard about conversion factor. Companies who have a DBMS and use it for a lot of their application programming would find it difficult to convert - even if conversion tools were available."

- "Too mystical to understand - must demonstrate."

- "People don't like to change, conversion is not popular - hard to sell."

- "Don't want to sign up with a company which may drop the product."

B. INPUT'S ANALYSIS

- Intel's strengths in the marketplace:

  - The system in terms of concept and technology is attractive to knowledgeable data processing professionals. It satisfies a definite need in the marketplace.

  - The price/performance is attractive and will permit the implementation of many data base facilities which have been impractical because of the cost of current software systems.

- Relational data structure (in combination with the DBC) will permit flexibility and responsiveness in today's highly dynamic systems environment. This will benefit programmers, data base administrators, and end users.

- The product is not premature in its timing - it addresses a recognized need in the marketplace. In all probability, the advantages of relational data structures will be popular (and understood) by the time volume production is planned.

- Intel's exposure in the marketplace:

  - The product is new and complex. The technology (associative memory, CCDs, relational data structures, and even the concept of a DBC) is not understood by the general EDP community.

  - The proper integration of such a system into the current data processing environment is a significant technological challenge. It will require specialized systems programming, applications programming knowledge and expertise in addition to engineering capability. (Engineers have always wondered why programming is such a problem, but be assured the problem is real and still exists.)

  - Most data processing personnel resist change because of past experience with systems conversions, new languages, and new hardware. Their management is tired of the expense which has been generated by "new solutions" to problems, and will settle for something which is "reliable" and works.

  - Demonstrated product support (systems engineering, maintenance, and training) is more important than cost. Most experienced DP managers have had bad experiences with support or new products.

  - The cost of "full support" is extremely expensive, especially in a start-up situation with a new system.

- Intel's image in the marketplace is not visible to many users and is not associated with computer systems. Other companies with good reputations and products have failed in the systems arena. This leads to the question of dedication to the particular business or product. There will be considerable skepticism.

- Over-riding the entire marketplace is IBM, and they will be the main competition regardless of whether they have a comparable product. The DBC is a threat to the heart of IBM's overall data processing strategy. They will react to this competition with "sufficient vigor" to assure a real fight in every sales situation.

VIII DBC FORECAST 1978-1983

VIII DBC FORECAST 1978-1983

A. FORECAST ASSUMPTIONS

- Due to marketing and support requirements for the DBC, only the domestic market will be addressed.

- The product's primary direction will be towards the large data base installations (IBM 370/158 (3031) and above).

- The potential market for the DBC will reflect both hardware (off-loading host) and software (current data base systems) replacement.

- The DBC will have demonstrable price/performance improvement of 5 to 1 over IMS for comparable transactions.

- Relational data bases will become more understood and acceptable before 1980 (regardless of IBM's strategy).

- Product support will be comparable to that currently provided by suppliers of plug compatible peripherals and mainframes. (This means in terms of response to problems - there will be more problems when supporting the DBC.)

- The revenues projected are for the basic DBC system as described in the product prospectus and do not include secondary storage.

B. MARKET FORECAST METHODOLOGY

- The use of large scale data processing systems in the United States will grow as follows:

	1978	1979	1980	1981	1982	1983
Installed L/S DBMS	2000	2580	3328	4293	5539	7144

- The above projections are based on research done for INPUT's Annual Report 1977. The report also indicated the value of data base system software revenues would increase from $70 million in 1976 to $250 million in 1982.

- The installed hardware value for large scale systems (Processor & Memory) using data base systems is approximately $4-5 billion. (2,000 installed systems in 1978.)

- It is assumed that the primary market for a DCB will be among heavy users of DBS (greater than 50% of processing power). This represents less than 25% of installed systems.

- The processing power subject to replacement is therefore approximately $1.1 billion. Add an additional $100 million for data base software sales in 1978, and the total market subject to displacement is $1.2 billion.

- Assume that IBM will have "holding power" on its market share (approximately 50%) over the range of the forecast. That means $600 million is subject to displacement in 1978.

- Normal "plug compatible" penetration against existing devices or processors has been 20%, and 6 of 30 interviewees (20%) in the DBC study indicated they would convert if the system met performance specifications.

- INPUT does not believe a system of the complexity of the DBC and requiring conversion can anticipate 20% market penetration (and the assumption of 5 times performance is at the low end of the scale). Therefore, penetration was adjusted 10%.

- This results in a $60 million market potential for data base computers in 1978. Projected out to 1982 (the requested forecast period), this indicates a $166 million market by that time. See Exhibit VIII-1.

- However, we feel there will be a tendency for the penetration to grow above 10% and this is approximated by the shaded area on Exhibit VIII-1.

C. DBC MARKET FORECAST

- Starting with the introduction of the DBC in 1979-1980, INPUT projected what it considered to be "orderly" penetration of the "potential market." Exhibit VIII-2 shows our projections of possible unit shipments and market share.

- "Average" configurations are assumed to be $500,000 through 1982, but it is felt that average configurations will tend to grow over the life of the system. This is reflected in the 1983 projection where the revenue is obtained based on average configurations of $600,000. (The revenue obviously includes expansion of systems installed prior to 1983.)

D. FORECAST QUALIFICATIONS

- INPUT forecasts that 50% or more market penetration against competitors other than IBM (they were assumed to hold their market share) is reasonable. Provided:

EXHIBIT VIII-1

POTENTIAL MARKET GROWTH FOR THE NON-IBM "DBC" PRODUCT LINE CONCEPT

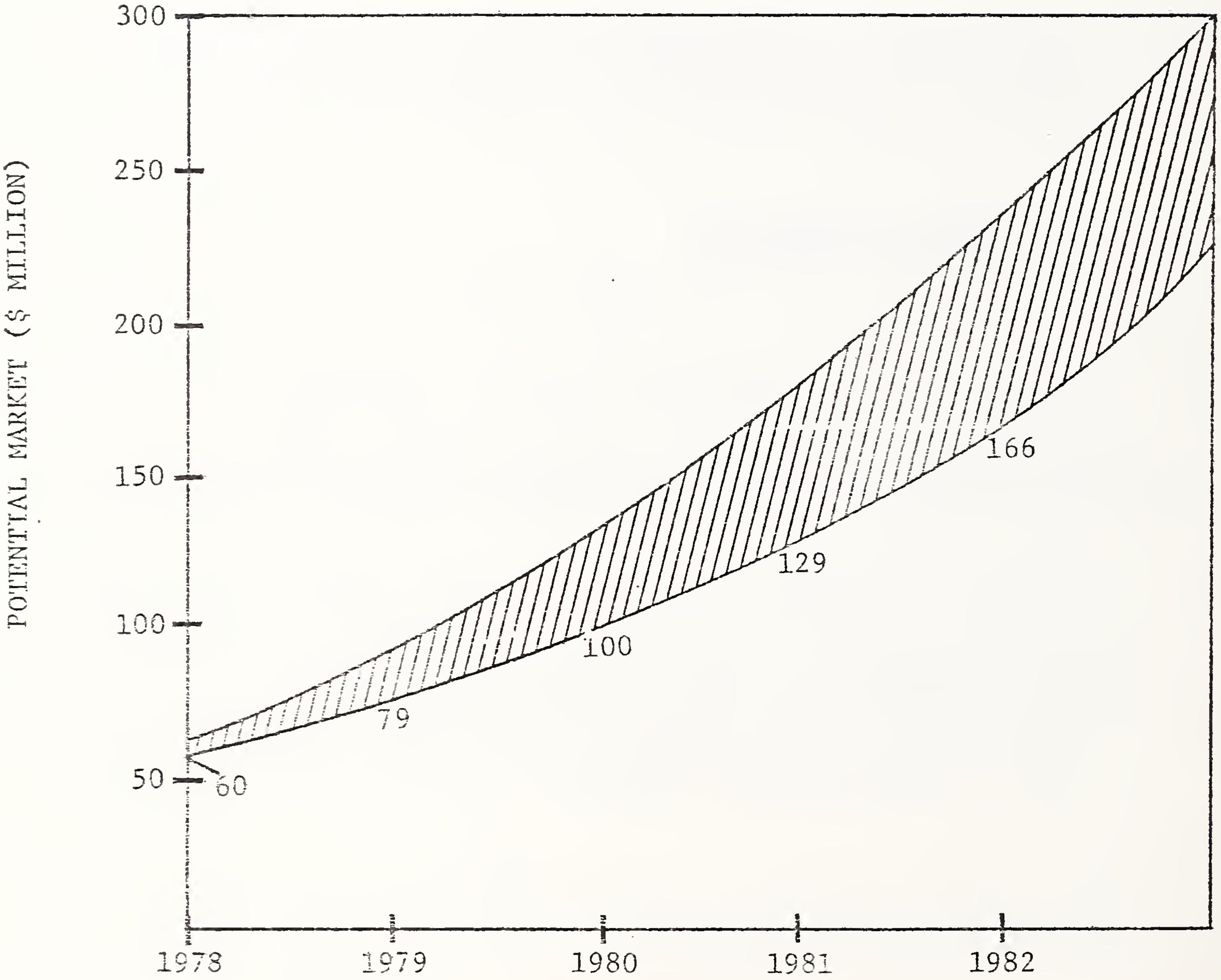


EXHIBIT VIII-2

INTEL "DBC" SHIPMENTS AND SATURATION OF POTENTIAL MARKET

YEAR	SHIPMENTS (UNITS)	REVENUE	MARKET SIZE	% OF MARKET
1979	0	$ 0	$ 75. M	0%
1980	6	3.	100.	3.
1981	40	20.	130.	15.
1982	100	50.	166.	30.
1983	200	120.	214.	56.

  - Intel enters the market on the timeframe projected.

  - Resources are available in both marketing and systems support.

- Conventional market research and forecasting techniques have consistantly failed when applied to products incorporating technological innovation - usually on the low side.

- The critical sensitivity is IBM market share - if it increases to 70% of installed DBS, the available remaining market would be reduced by 40% to $36 million in 1978 and $100 million in 1982. This would still permit Intel to achieve the projected revenues of $50 million with 50% penetration of the market.

APPENDIX I: INTERVIEWS CONDUCTED

APPENDIX 1: INTERVIEWS CONDUCTED

I. GENERAL INTERVIEWS

	TYPE	ON SITE	PHONE
Edward J. Hagman, Manager Employee Information Systems Atlantic Richfield Corporation	Process Mfg.	X	
Sherrill Overfield, Manager Data Base Administration TRW	Discrete Mfg.	X	
Rudy Fontes, Manager Data Base Administration Northrop	Discrete Mfg.	X	
David Tommela, Project Manager Customer Information Systems Southern California Edison	Electric Utility	X	
Confidential Non-DOD Agency	Federal Govt.		X
Jules Schwartz, Director Computer Sciences Corp.	Computer Services Vendor		X

	TYPE	ON SITE	PHONE
John Lausas, Manager Technical Support Allied Van Lines	Transportation Services		X
Tim Huckabay Data Base Administrator Teletype Corp.	Discrete Mfg.		X
John Sikora, Manager Technical Services Alden's	Retail		X
Eldon Bartsch Manager Technical Support Lennox Industries	Discrete Mfg.		X
Thomas Grimes, Supervisor Data Systems AT & T	Telephone Utility		X
Ron VanderMeer Data Base Administrator Whirlpool Corp.	Discrete Mfg.		X
Ralph Cortner Data Base Administrator Petroleum Information Corp.	Publisher		X
Michael Holley, Manager Data Base Administration Dow Chemical USA	Process Mfg.		X
Ron Hiles Data Base Administrator Allegheny Airlines	Airline		X
Bill Grover Data Base Manager McDonald's	Restaurant Chain		X
Richard S. Zakrzewski Assistant DP Manager Northwestern Mutual Life	Insurance		X
Oral Balzer Data Administrator Boeing Computer Services	State Govt.		X

	TYPE	ON SITE	PHONE
Jim Curtman Data Base Administrator Boeing Computer Services	Computer Services Vendor		X
Frank Kirshenbaum Technical Support Manager Equitable Life Assurance Society	Insurance		X
J. Spitz Director MIS Vivatar	Discrete Mfg.		X
Confidential, Development Manager IBM	Discrete Mfg.		X
Confidential VA Hospitals	Federal Govt.		X
J. Hittman Systems Programmer National CSS	Computer Services Vendor	X	
B.L. Garnett Data Base Administrator Virginia Electric Power	Electric Utility	X	
Gerry Weinberg, Manager Systems Support Bank of America	Banking	X	
Honien Liu Director, MIS Pacific Gas & Electric	Gas & Electric Utility	X	
L. Rakozi Vice President Development Tymshare	Computer Services Vendor	X	
E. dePashalais Vice President, MIS Mervyn's	Retail	X	
Jack MacCrisken, Manager Data Base Administration Intel	Discrete Mfg.	X	

II. PARTIAL INTERVIEWS

	TYPE	ON SITE	PHONE
Keith Rose Data Base Manager State of Illinois	State Govt.		X
Rod Price, Director Medical Computer Center University of Missouri	University		X
Eric Fairchild, Manager Major Systems Programs Bank of America	Bank		X
Medford John Jr Campbell Statistical Systems Analyst Health Education & Welfare	Federal Govt.		X

APPENDIX II: OTHER INTERESTED PARTIES

APPENDIX II: OTHER INTERESTED PARTIES

- The following people expressed interest in the product but were not interviewed:

Judy Hamilton
Manager, Commercial Software Factory
System Development Corp.
2500 Colorado Ave.
Santa Monica, CA 90406

Chuck Gahr
Union Research Center
P.O. Box 76
Brea, CA 92621

Paul Feldman
Head, Systems Development Branch
Naval Intelligence Support Center
4301 Suitland Rd.
Washington, DC 20390

G.B.S. Mani
Supervisor Data Base Support
Atlantic Richfield
645 S. Mariposa Ave.
Los Angeles, CA 90005

Sharon Bonner
Manager, Software & Procedures
Fairchild Camera & Instruments
MS 22110
464 Ellis St.
Mountain View, CA 94042

Jim Harder
Technical Assistant to General Manager
Boise Cascade
P.O. Box 50
Boise, Idaho 83728

William Rawsky
Manager, Technical Support
White Motors
35129 Curtis Blvd
Dept. 310, DP Services
East Lake, Ohio 44094

F.R. Noiva
Manager, CDP Support
AETNA Life & Casualty Co.
151 Farmington Ave.
Hartford, CT 06156

Jerry Schade
State of Colorado
Division of EDP
2002 So Colorado Blvd
Denver, CO 80222

M.H. Ford
Manager, Computer Systems Division
Standard Oil of California
525 Market St.
San Francisco, CA 94105

C.R. Cortright
Hughes Tool
1901 W. Malvern 606/K128
Fullerton, CA 92634

Sidney Hasin
Director of Computer Technology
North American Rockwell
2201 Seal Beach Blvd
Long Beach, CA

Joseph B. Sansome
Vice President
Consolidated Edison
4 Iwing Place
New York, NY 10003

Peter D. Rosenow
Vice President and Manager
Crocker National Bank
155 Fifth St.
San Francisco, CA 94103

Robert G. Kramer
Manager US Group DP
Levi Strauss & Co.
340 Market St.
San Francisco, CA 94111

Fenwick Holmes
Manager, Data Processing
Del Monte Corporation
1 Market Plaza
San Francisco, CA

APPENDIX III: RESPONDENTS CONCERNED WITH TECHNICAL DETAILS OF THE PRODUCT PROSPECTUS

APPENDIX III: RESPONDENTS CONCERNED WITH TECHNICAL DETAILS OF THE PRODUCT PROSPECTUS

- A number of respondents were concerned with the lack of technical detail on the product prospectus or raised questions on how Intel proposed to handle certain functions. Their comments can be found in the following questionnaires:

INT 3	NORTHROP CORP.
INT 6	COMPUTER SCIENCES CORP.
INT 17	NORTHWESTERN MUTUAL
INT 18	STATE of CALIFORNIA
INT 20	EQUITABLE LIFE
INT 26 & 18	BANK of AMERICA
INT 36	STATE of ILLINOIS

APPENDIX IV: QUESTIONNAIRE

APPENDIX IV

DATA BASE COMPUTER QUESTIONNAIRE

1. What percent of your applications lend themselves to DBMS? ______?

   a) What types of applications are best suited? ______

   ______

   ______

   b) What types are least suited? ______

   ______

   ______

2. What DBMS systems are you currently using? ______

   ______

   ______

   a) % of applications ______

   b) % of processing time ______

   c) Cost to convert from former mode of operation (hardware, software, personnel)? ______

   ______

3. What is the current size of your on-line data base? ______

   ______

   ______

   a) Bytes of on-line storage ______

   b) % of total on-line storage ______

4. How are you currently operating your DBMS? (Dedicated, mixed, multiple systems)

____

____

____

5. Do you estimate your use of DBMS will change in the next few years?

____

a) 1978 _____ % of increase or decrease

b) 1980 _____ %

c) 1982 _____ %

6. How do you evaluate your current DBMS?

a) Strong points? ____

____

____

b) Weak points? ____

____

____

c) Reliability? ____

____

____

d) Needed Improvements? ______________________________________

____

7. There has been a great deal of discussion concerning different data models, what is your assessment of the advantages and disadvantages of:

% of Application

a) Hierarchical Structures ______

b) Network Structure ______

c) Relational Structures ______

d) What % of your applications can be satisfied by each? ______

8. INTEL has proposed developing a Data Base Computer with unique hardware and software features. Many potential benefits have been claimed for such as system. On a scale of 1-5 how important do you consider these benefits? (1 = very important, 5 = not important).

a) Backs-end	Now	1980
Off-load host	______	______
Data Base Sharing	______	______
Network Data Exchange	______	______
Change Mainframes	______	______
Distinct Data Base Hardware	______	______
Improved Cost Performance	______	______
Enhanced Data Security	______	______
Provides Consistancy (OS & Compilers)	______	______
Distributed Processing (Availability)	______	______
b) Set-Oriented Processing		
Reduce Applications Programming	______	______
Reduces Data Transfer	______	______
Optimize Data Manipulation	______	______
c) Associative Processor		
Efficient Execution	______	______
Balances Response Times	______	______
Eliminates Indexing	______	______
Reduces Storage Requirement	______	______
Greater Concurrency	______	______
Reduces DB Administration Complexity	______	______

c) Associative Processor (Continued)

	Now	1980
Improves Command Translation		
Modularity of Architecture (Low cost increments)		
Improved Reliability		
Improved Security & Integrity		
Reduces Data Transfer		

9. Would these benefits prompt you to convert from your current systems?

If not, why not?

10. Would you need conversion assistance?

a) Software Tools?

b) Systems engineering support?

c) Would you expect to Pay?

11. What would be the most important savings you would expect? (Rank in order of importance)

	Rank
a) Hardware	_______
b) Storage	_______
c) People	_______
d) Responsiveness	_______

12. What demonstrable cost saving would justify a change?

a) _______ <$100,000 per year

b) _______ $100,000 per year

c) _______ $250,000 per year

d) _______ >$250,000 per year

13. What percentage of your processing against data bases lends itself to set-oriented operations? _________%

14. Do you feel the performance characteristics claimed are attractive?

(Rate 1-5) ___________.

15. Would the Data Base Computer with these performance characteristics permit you to implement new applications?

a) What kind? ______________________________

b) If no, why not? ______________________________

16. Would you require support for existing systems?

a) Functionally ______________________________

____

____

b) Data Model ______________________________

____

____

c) Languages (Data Manipulation, Query) ______________________________

____

____

17. Would you require a procedural language or would interfaces be sufficient?

a) Procedural Language Required? ______________________________

____

____

b) Language Interfaces desired? ______________________________

____

____

18. How would you characterize your reaction to the DBC?

______ Enthusiastic

______ Interesting

______ Skeptical

______ Confusing

______ Who needs it

19. What do you think will be its strengths in the marketplace?

29. What will be the primary thing inhibiting its acceptance?

30. Any other comments.